POLYGONAL SURFACE MESH QUALITY IMPROVEMENT

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A good quality surface mesh is an essential prerequisite for obtaining good solid meshes. The challenge with surface mesh quality improvement is optimize element quality while preserving surface characteristics as much as possible. In previous work[1], a novel method was presented by the authors to improve the quality of triangle and quadrilateral meshes using a local parameterization method thus avoiding the need for an underlying smooth surface or expensive global parameterizations. In this method the nodes of the mesh are repositioned in a series of local parametric spaces derived from barycentric or isoparametric mapping of the original mesh elements. In this work, this method has been extended to the improvement of arbitrary polygonal surface meshes that can be used as the surface of general polyhedral meshes in 3D. The local parametric space of the polygons is derived using a generalized barycentric mapping technique developed by Meyer et. al. [2]. Using the generalized barycentric mapping, the nodes are repositioned such that they always remain on the polygonal faces of the original mesh and thereby, preserve the essential characteristics of the mesh.

References
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[2] M. Meyer, H. Lee, A.H. Barr, M. Desbrun "Generalizing Barycentric Coordinates for Irregular N-gons," *Journal of Graphics Tools*, 7(1), pp. 13-22, 2002.